APPARATUS AND METHOD FOR FABRICATING CHIRAL FIBER GRATINGS

ABSTRACT

An apparatus and method for fabricating fiber gratings from optical fibers by imposing constant or variable chiral refractive index modulation along an optical fiber. The refractive index modulation may be of single helix symmetry to produce a fiber grating enabling different propagation speed of signals with the same handedness as the structure with respect to signals with opposite handedness as the structure at a wavelength substantially equal to the pitch of the single helix, or of double helix symmetry to produce a chiral fiber Bragg grating. In several embodiments of the present invention the refractive index modulation is imposed by twisting and moving a specially prepared optical fiber through a heater that heats a small region of the fiber to a temperature sufficient to allow the fiber to twist in that region as it moves through the heater. Alternately, a normal optical fiber may specially prepared for use with the apparatus of the present invention at a pre-process stage prior to twisting and heating. In other embodiments of the inventive apparatus, the refractive index modulation is imposed by cutting one or more helical groove patters into a normal optical fiber, or by wrapping a normal fiber with one or more elongated dielectric fibers of a smaller diameter than the optical fiber in one or more helical patterns. Advantageously, the fabrication of the chiral fiber grating may be monitored and the fabrication parameters automatically adjusted to ensure that the chiral fiber grating meets desired requirements.